January 11, 2013

Clean Line Energy Partners LLC (Clean Line) appreciates the opportunity to provide comments on the preliminary renewable energy siting scenarios recommended by the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC). Clean Line is developing the Centennial West Clean Line transmission project, an estimated 900-mile, high voltage direct current (HVDC) transmission line connecting renewable energy resources in Arizona and New Mexico to load centers in California.

The current renewable portfolio assumptions outlined by the CPUC and CEC at the December 9, 2012 stakeholder workshop do not contemplate significant amounts of renewable generation connected to the CAISO system via HVDC lines. Long-haul, HVDC transmission projects that will deliver high-quality, low cost renewable resources directly to California are one of several, very attractive options through which California can meet its renewable portfolio standard and greenhouse gas reduction goals. For the reasons discussed below, the recommended renewable portfolio should be modified to include high-value external-to-California resources transmitted via HVDC transmission directly to California. In addition, the process by which generation is analyzed through the renewable portfolio standard (RPS) calculator and scored under each scenario should be more transparent, and the data should be updated.

1. High quality wind resources are plentiful in the states from which California can import.

According to an assessment by the National Renewable Energy Laboratory (NREL) and AWS Truepower[1], the available land area in California (excluding areas unlikely to be developed) with a 40% gross capacity factor at 100 meters is significantly less than that in many other Western states including Montana, Wyoming, and New Mexico, as seen in the table below.

	Available Land with 40%+ CF at 100 meters (km^2)
Montana	117,352
Wyoming	70,373
New Mexico	51,941
California	1,325

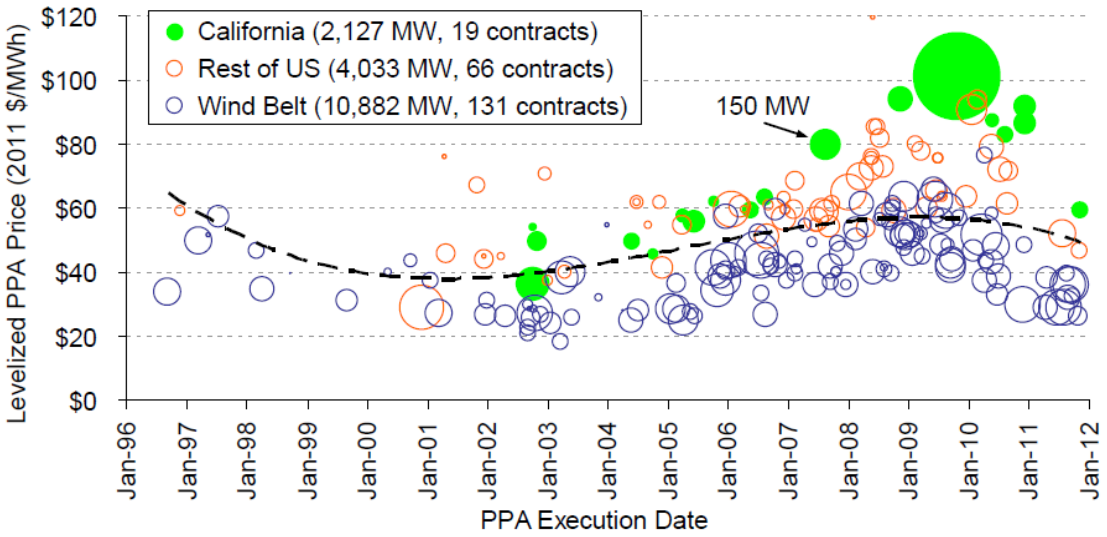
2. Wind power imports are cheaper than in-state wind or solar.

Due to the higher capacity factors, as well as reduced land and construction costs, out-of-state wind is a more economical way to reach high renewable energy penetrations. A comparison of California wind

[1] "Wind Powering America." National Renewable Energy Laboratory and AWS Truepower. Updated April 24, 2011.

power purchase agreement prices versus prices in the rest of the country is shown in the following figure from the Department of Energy's 2011 Wind Technologies Market Report.

Figure 1



This graph illustrates that wind PPAs in the wind belt states (including New Mexico and Wyoming) are typically under $40/MWh for agreements signed since 2010. Meanwhile, most California wind PPAs signed during the same period were over $80/MWh. Even when a transmission charge of $25/MWh (based on Clean Line estimates for a 900 mile HVDC facility) is included, the delivered cost of wind would be well below both in-state wind and in-state solar PV prices (estimated at about $115/MWh in the RPS Calculator).

3. The RPS Calculator dramatically overestimates the cost of out-of-state wind and associated transmission

The RPS Calculator assumes New Mexico wind costs $85.61/MWh to generate, more than double the current market price of $30-40/MWh. The RPS Calculator assumes a transmission cost of over $70/MWh, while Centennial West estimates a $25/MWh transmission charge, including electric losses. Finally, the RPS calculator assumes losses to be over 9% for resources from New Mexico delivered to California, when, in fact, HVDC losses would be in the range of 5-6%.

The RPS Calculator must be updated based on empirical study and stakeholder input. Without such an update, it will produce highly unreliable results.

4. Out-of-state wind can reduce land use impacts.

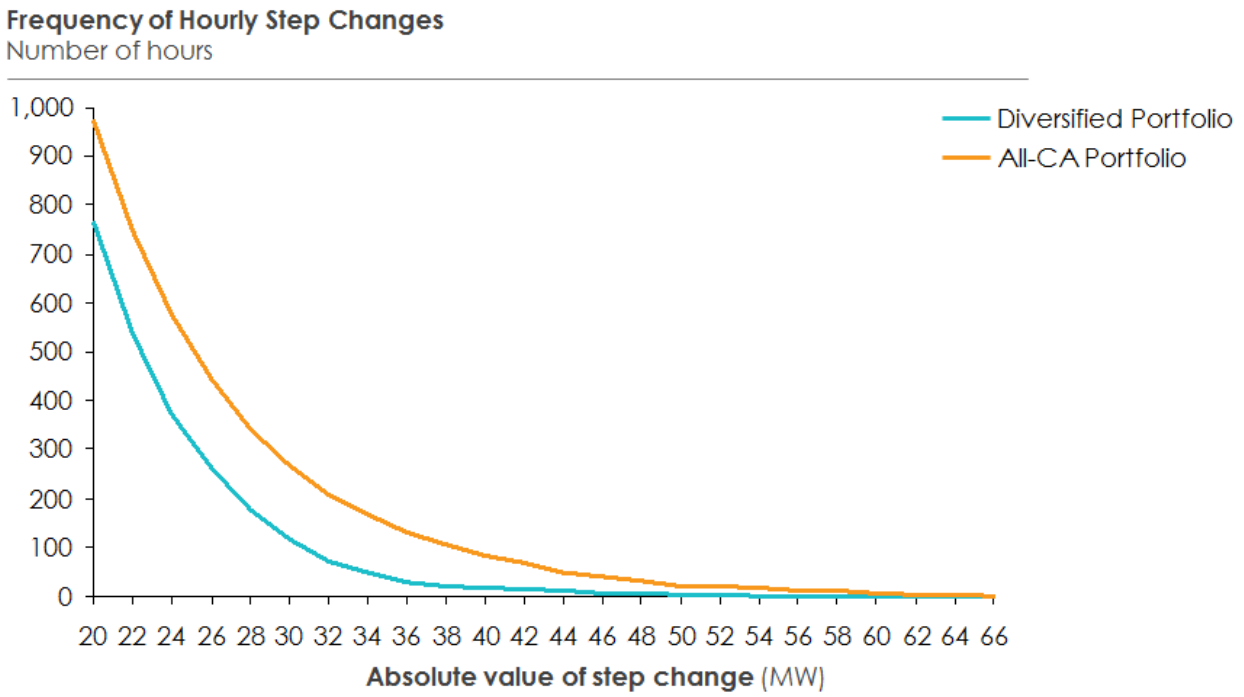
Sourcing more RPS generation out-of-state can ensure that land use impacts from new renewable facilities do not disproportionately affect sensitive ecosystems like the Mojave Desert. As an example,

meeting half of California's "net short" of 32,184 GWh in 2022 with large-scale solar PV would require about 24,000 acres of land. This assumes an energy density of 170 kWh/square meter. [2]

5. Imported wind can facilitate renewable integration.

Increasing the geographic diversity of a generation portfolio also provides integration benefits. By integrating geographically diverse, uncorrelated (to California-based resources) wind resources through HVDC transmission, the CAISO can greatly reduce variability by decreasing the likelihood that wind generation will ramp up or down simultaneously. See Figure 2 below.

Figure 2

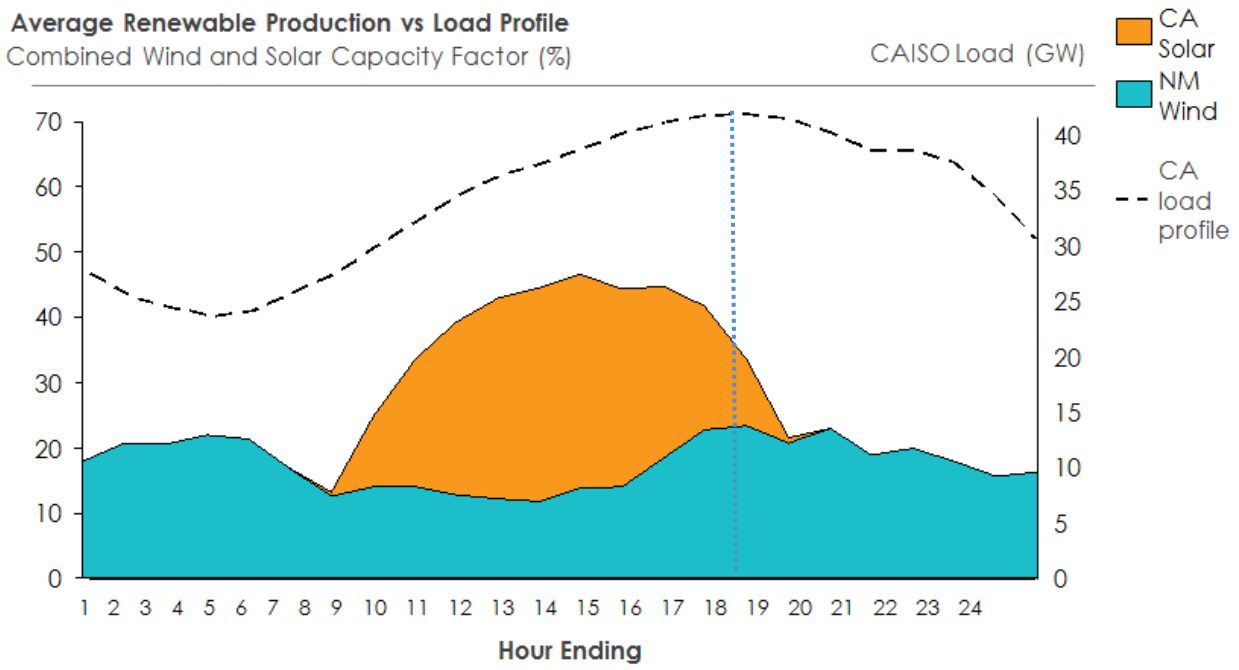


The above figure shows how frequently over the course of three years a given change in wind output (measured in MW) occurs in a one hour period. The orange line represents output taken from only California wind farms, while the blue line represents output from three wind farms, one each in California, Wyoming and New Mexico. The wind farms were chosen to keep nameplate capacity constant in both portfolios. The underlying production data are sourced from NREL's Western Wind Integration and Solar Study. Large hourly changes in output (called "step changes") occurred more often in the All-CA Portfolio than they did in the Diversified Portfolio.

[2] See P. Denholm and R. Margolis. "Impacts of Array Configuration on Land-Use Requirements for Large-Scale Photovoltaic Deployment in the United States." NREL, 2008.

Combining imported wind and California solar also creates a production profile that more closely fits California's load profile, as shown in Figure 3.

Figure 3



In Figure 3, equal nameplate capacities of California solar and New Mexico wind are modeled using data from NREL and 3Tier, a leading wind forecasting firm. The average, combined capacity factor (left axis) is then plotted against the shape of California load (in GW, right axis).

The vertical blue dashed line represents the peak load. At this time, when the system most needs energy to meet demand, New Mexico wind provides more energy, on average, than California solar.

In summary, out-of-state resources delivered to California through HVDC lines will allow the state to meet its RPS targets at the lowest cost possible. Out-of-state wind, moreover, complements in-state state solar projects in terms of its diurnal pattern. Resource diversity will become even more important should RPS targets increase. Unfortunately, the preliminary portfolio of resources described during the December 19 workshop improperly omits consideration of broad Western resources available to California consumers. Therefore, prior to submittal to the CAISO, the CEC and CPUC should incorporate low-cost, out-of-state renewable generation into the portfolio. At the very least, an updated RPS Calculator is necessary for any reasonable comparison of alternatives.

Respectfully submitted,

Jimmy Glotfelty, Executive Vice President
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